

The opinion in support of the decision being entered today was ***not*** written for publication and is ***not*** binding precedent of the Board.

Paper No. 31

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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Ex Parte TAKASHI INUJIMA, NAOKI HIROSE,  
MAMORU TASHIRO and SHUNPEI YAMAZUKI

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Appeal No. 1998-1635<sup>1</sup>  
Application 08/470,596

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HEARD: January 11 , 2001

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Before, WARREN, LIEBERMAN and JEFFREY T. SMITH, Administrative Patent Judges.

JEFFREY T. SMITH, Administrative Patent Judge.

Decision on appeal under 35 U.S.C. § 134

Applicant appeals the decision of the Primary Examiner finally rejecting claims 24, 25, 27-32, 34, 35, 37-39 and 41-48, all the claims in the application. We have jurisdiction under 35 U.S.C. § 134.<sup>2</sup>

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<sup>1</sup> This appeal is related to Appeal No. 1998-1065, corresponding to application Serial No. 07/993,523, now before us for decision.

<sup>2</sup> In rendering this decision we have considered Applicants arguments contained in the corrected Appeal Brief filed April 17, 1997. The claims on appeal have been amended by paper no. 3, filed June 6, (continued...)

## **BACKGROUND**

The invention is directed to a plasma chemical vapor reaction method capable of cyclotron resonance. The method includes the steps of inputting a reactive gas into a plasma generating space, emitting microwaves into the reaction chamber and establishing a magnetic field. The magnetic field is said to be established substantially parallel to the direction of propagation of the microwaves. The magnetic field is said to cause cyclotron resonance at a position within the reaction chamber. (Specification, pages 2-4). Claim 24 which is representative of the invention is reproduced below:

24. A plasma chemical vapor reaction method capable of cyclotron resonance comprising the steps of:

inputting a reactive gas into a reaction chamber;

emitting microwaves into said reaction chamber at a frequency through a window in a direction of propagation;

establishing a magnetic field in said reaction chamber where the magnetic field is directed substantially parallel to the direction of propagation of the microwaves and has a strength sufficient to cause cyclotron resonance at a position in the reaction chamber;

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<sup>2</sup>(...continued)

1995, paper no. 6, filed February 7, 1996, after final amendment paper no. 8, filed August 23, 1996, after final amendment paper no. 11, filed September 5, 1996, after final amendment paper no. 15, filed October 24, 1996, after final amendment paper no. 17, filed December 17, 1996, and after final amendment paper no. 24, filed September 3, 1997. All of the after final amendments have been entered in to the present record by the Examiner.

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exhausting the reaction chamber to establish a predetermined pressure in the chamber; and

holding a substrate located substantially at said position in the reaction chamber on a holder, wherein the strength of the magnetic field decreases along a line extending through said substrate in the direction of propagation of the microwaves.

As evidence of obviousness, the Examiner relies on the following

references:

Sirtl	3,661,637	May 9, 1972
McNeilly et al. (McNeilly)	4,047,496	Sept. 13, 1977
Asmussen et al. (Asmussen)	4,727,293	Feb. 23, 1988
Yamazaki	5,266,363	Nov. 30, 1993

Hiryoshi Aida (Aida I)	JP60-103098	June 7, 1985
Printed Japanese Patent Application		

Hiryoshi Aida (Aida II)	JP61-158898	Dec. 4, 1986
Printed Japanese Patent Application		

### ***THE REJECTIONS***

The Examiner entered the following ground of rejections:

A. Claims 24, 27, 28, 30-32, 34, 38, 39 and 41-48 are rejected as being unpatentable under 35 U.S.C. § 103(a) over the combination of Aida I, Aida II and Asmussen. (Examiner's Answer, page 5).

- B. Claims 25 and 29 are rejected as being unpatentable under 35 U.S.C. § 103(a) over Aida I, Aida II and Asmussen in combination with Yamazaki. (Examiner's Answer, pages 9 to 10).
- C. Claims 35 and 37 are rejected as being unpatentable under 35 U.S.C. § 103(a) over the combination of Aida I, Aida II and Asmussen in combination with Sirtl or McNeilly. (Examiner's Answer, page 10).
- D. Claims 27, 31, 43 and 47 are rejected as being unpatentable under 35 U.S.C. § 112, second paragraph. (Examiner's Answer, page 3).

### ***OPINION***

A. Section 112, Second Paragraph, Rejections

The examiner must demonstrate that the claims do not “set out and circumscribe a particular area with a **reasonable** degree of precision and particularity”. *In re Moore*, 439 F.2d 1232, 1235, 169 USPQ 236, 238 (CCPA 1971). The purpose of the second paragraph of Section 112 is to basically insure an **adequate** notification of the metes and bounds of what is being claimed. *See In re Hammack*, 427 F.2d 1378, 1382, 166 USPQ 204, 208 (CCPA 1970).

The Examiner has rejected claims 27 and 31 as being unpatentable under 35 U.S.C. § 112, second paragraph as being indefinite. According to the Examiner, the phrase “mixed resonance” lacks a clear definition. (Examiner's

Answer, page 4). We disagree. The specification discloses that mixed resonance occurs under conditions similar to ECR except the pressure is elevated  $10^2$ - $10^5$  times. The specification also discloses the pressure can range from 1 to 800 Torr. (See specification page 2, lines 18-20, page 4 lines 19-23 ). Thus, the specification sets forth the conditions required to establish “mixed resonance.” Accordingly, we reverse the Examiner’s decision rejecting claims 27 and 31 under 35 U.S.C. § 112, second paragraph.

The Examiner has rejected claim 43 under 35 U.S.C. § 112, second paragraph. According to the Examiner:

As claim 43 (line 6) still only reads on “the microwave” (singular), hence “the microwave” lacks proper antecedent basis, as all other analogous terms have been made plural in the after final amendments. (Examiner’s Answer, page 3)

On this record, there simply is no explanation on the part of the Examiner why the metes and bounds of the claims are not set forth with “a **reasonable** degree of precision and particularity”. The microwaves of claim 43 have a frequency of 2.45 GHz. The occurrence of “microwave” on line 6 refers to the frequency at which the microwaves are emitted. Accordingly, we reverse the Examiner’s decision rejecting claims 43 under 35 U.S.C. § 112, second paragraph.

B. The 35 U.S.C. § 103(a) rejection of claims 24, 25, 27 to 32, 34, 35, 37, 38, 39 and 41 to 48.

It is well established that the Examiner has the initial burden under § 103 to establish a *prima facie* case of obviousness. *In re Oetiker*, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992); *In re Piasecki*, 745 F.2d 1468, 1471-72, 223 USPQ 785, 787-88 (Fed. Cir. 1984). To that end, the Examiner must show that some objective teaching or suggestion in the applied prior art, or knowledge generally available in the art would have led one of ordinary skill in the art to arrive at the claimed invention. *Pro-Mold & Tool Co. v. Great Lakes Plastics, Inc.*, 75 F.3d 1568, 1573, 37 USPQ2d 1626, 1630 (Fed. Cir. 1996).

Claims 24, 27, 28, 30-32, 34, 38, 39 and 41 to 48 are rejected as being unpatentable under 35 U.S.C. § 103(a) over the combination of Aida I, Aida II and Asmussen. Claims 24 and 28 are the only independent appealed claims and we therefore will limit our discussion to these claims. Upon careful review of the entire record including the respective positions advanced by Appellants and the Examiner, we find that the Examiner has not carried his burden of establishing a *prima facie* case of obviousness.

Claims 24 and 28 are drawn to chemical vapor reaction method capable of cyclotron resonance. Cyclotron resonance occurs when microwaves energize a reactive gas into a plasma state. Cyclotron resonance plasma is generated by electronic discharge resulting from collision of electrons within the hydrocarbon

gas. Magnetic fields are used to adjust the location of the resonating space.

(Specification, page 1, lines 6-13).

Aida I and Aida II are directed the manufacture of ornamental diamonds by utilization of electron cyclotron resonance chemical vapor deposition. The electron cyclotron resonance apparatus includes electromagnets arranged on the outside of the reactor which produce a magnetic field inside the reactor. Microwaves, hydrogen gas and hydrocarbon gas are introduced into the reactor wherein cyclotron resonance plasma is generated by electronic discharge resulting from collision of electrons within the hydrocarbon gas. The plasma provides vapor phase growth of diamond film on a substrate located within the reactor. (Aida I, page 3; Aida II, page 4). Aida I and Aida II also discloses controlling the temperature of the substrate and the and pressure of the reaction chamber. (Aida I, page 4; Aida II, page 5).

Asmussen is directed to an ion generating apparatus for producing plasma disk by utilization of ECR. The electron cyclotron resonance apparatus includes electromagnets arranged on the outside of the plasma chamber region which produce a magnetic field inside the reactor. Microwaves, hydrogen gas and hydrocarbon gas are introduced into the reactor. In the plasma region, electron cyclotron resonance is generated by electronic discharge resulting from collision of

electrons within the hydrocarbon gas. (Asmussen, column 6, lines 38-45).

Asmussen discloses that the ECR zone position (Fig. 1, no. 35) can be varied by increasing or decreasing the strength of the magnets. Increasing the magnetic field strength moves the ECR surface away from the walls further into the center of the discharge. Decreasing the magnetic strength moves the surface towards the walls of the plasma region. (Asmussen, column 7, lines 23-31). Asmussen further discloses variations to the ECR system which including moving the location of the magnets. (Asmussen, column 7, line 49 to column 8, line 38).

The Examiner relies upon the combined teachings of Aida I, Aida II and Asmussen to describe a system for generating cyclotron resonance wherein magnetic fields are used to adjust the resonating space. The Examiner acknowledges Aida I and Aida II do not disclose placing the substrate at a position where ECR is established. (Answer, pg. 7, second paragraph). The Examiner asserts that Asmussen discloses electromagnets can be used to adjust the ECR location. (Answer, paragraph bridging pgs. 7 and 8). Thus, the Examiner concludes it would have been prima facie obvious to one of ordinary skill in the art to conduct the process of Aida I and Aida II with adjustable electromagnet means in view of Asmussen. We do not agree.



Claims 24 and 28 require the target substrate to be placed in the reaction chamber at the point of ECR. Claims 24 and 28 also require the strength of the magnetic field decreases along a line extending through said substrate in the direction of propagation of the microwaves. Adia I and Adia II disclose the placement of the target substrate within the electron cyclotron plasma. However, both are silent as to the recognition of the ECR position and the need for the magnetic field to decrease along a line extending through said substrate in the direction of propagation of the microwaves. Asmussen recognizes the ECR zone and discloses that the ECR zone position can be varied by increasing or decreasing the strength of the magnets. However, Asmussen does not disclose placing the target substrate within the ECR position. Asmussen also does not disclose the magnetic field decreases along a line extending through said substrate in the direction of propagation of the microwaves. The Examiner has not direct us to motivation for placing the substrate at the position where ECR is established or why it would have been obvious to adjust the magnetic field so that it decreases along a line extending through said substrate in the direction of propagation of the microwaves.

Claims 25 and 29 are rejected as being unpatentable under 35 U.S.C. § 103(a) over Aida I, Aida II and Asmussen in combination with Yamazaki.

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Claims 35 and 37 are rejected as being unpatentable under 35 U.S.C. § 103(a) over the combination of Aida I, Aida II and Asmussen in combination with Sirtl or McNeilly. Claims 25, 29, 35 and 37 depend upon either claim 24 or 28. The Examiner add the Yamazaki, Sirtl and McNeilly references to address the additional limitations of the rejected claims. Yamazaki, Sirtl and McNeilly do not solve the deficiencies in the Examiner's *prima facie* case identified above. Consequently, claims 25, 29, 35 and 37 are patentable for the reasons stated above regarding claims 24 and 28.

In the absence of sufficient factual evidence or scientific rationale to establish why and how a skilled artisan would have arrived at the subject matter of claims 24 and 28 from the applied references, we find that the initial burden of establishing the *prima facie* obviousness of the claimed subject matter has not been met. Accordingly, we are constrained to reverse the Examiner's 35 U.S.C. § 103(a) rejections of claims 24, 25, 27 to 32, 34, 35, 37, 38, 39 and 41 to 48.

### ***CONCLUSION***

The rejection of claims 24, 27, 28, 30-32, 34, 38, 39 and 41-48 as unpatentable under 35 U.S.C. § 103(a) over the combination of Aida I, Aida II and Asmussen is reversed.

The rejection of claims 25 and 29 are rejected as unpatentable under

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35 U.S.C. § 103(a) over Aida I, Aida II and Asmussen in combination with Yamazaki is reversed.

The rejection of claims 35 and 37 are rejected as unpatentable under 35 U.S.C. § 103(a) over the combination of Aida I, Aida II and Asmussen in combination with Sirtl or McNeilly is reversed.

The rejection of claims 27, 31, 43 and 47 as unpatentable under 35 U.S.C. § 112, second paragraph is reversed.

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Time for taking action

No time period for taking any subsequent action in connection with this  
appeal may be extended under 37 CFR § 1.136(a).

**REVERSED**

CHARLES F. WARREN  
Administrative Patent Judge

PAUL LIEBERMAN  
Administrative Patent Judge

JEFFREY T. SMITH  
Administrative Patent Judge

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